SOLAR/1018-79/02

Monthly Performance Report

STEWART-TEELE-MITCHELL

FEBRUARY 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

STEWART-TEELE-MITCHELL

FEBRUARY 1979

I. SYSTEM DESCRIPTION

The Stewart-Teele-Mitchell site is a single-family residence in Malta, New York. The home has approximately 1900 square feet of conditioned space. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 432 square feet. The array faces south at an angle of 45 degrees to the horizontal. A glycol/water solution is the transfer medium that delivers solar energy from the collector array to a heat exchanger. Water is then used as the transfer medium that delivers solar energy from the heat exchanger to storage, and to the space heating and DHW loads. Solar energy is stored in the basement in a 1000-gallon insulated tank. Preheated city water is stored in a 75-gallon preheat tank and supplied, on demand, to a conventional 40-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, an oil-fired furnace provides auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has five modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the collector temperature exceeds the storage temperature by 20°F and terminates when a temperature difference of 3°F is reached. Solar energy is transferred through the heat exchanger that transmits energy from the solar collection loop to the storage loop. Collector loop pump P1 and storage loop pump P2 are operating.

Mode 2 - Collector-to-Space Heating: This mode activates when mode 1 conditions are satisfied and there is a demand for space heating. The collected solar energy bypasses storage and flows directly to the solar heating coil in the air-handling system. Mode diversion valve V2 is open.

Mode 3 - Storage-to-Space Heating: This mode activates when there is a demand for space heating, the temperature at the top of the storage tank exceeds 100°F, and solar energy from the collector is not available. Pump P3 is operating.

Mode 4 - Storage-to-DHW Tank: This mode activates when the temperature at the top of the storage tank exceeds the preheat tank water temperature by 10°F. Pump P4 is operating.

Mode 5 - Summer Mode, Collector-to-Vent: This mode activates when the collector array output fluid temperature exceeds 220°F. The collected solar energy is rejected through a fintube heat exchanger located outside the dwelling. Valve V1 directs the collector loop flow through a purge unit.

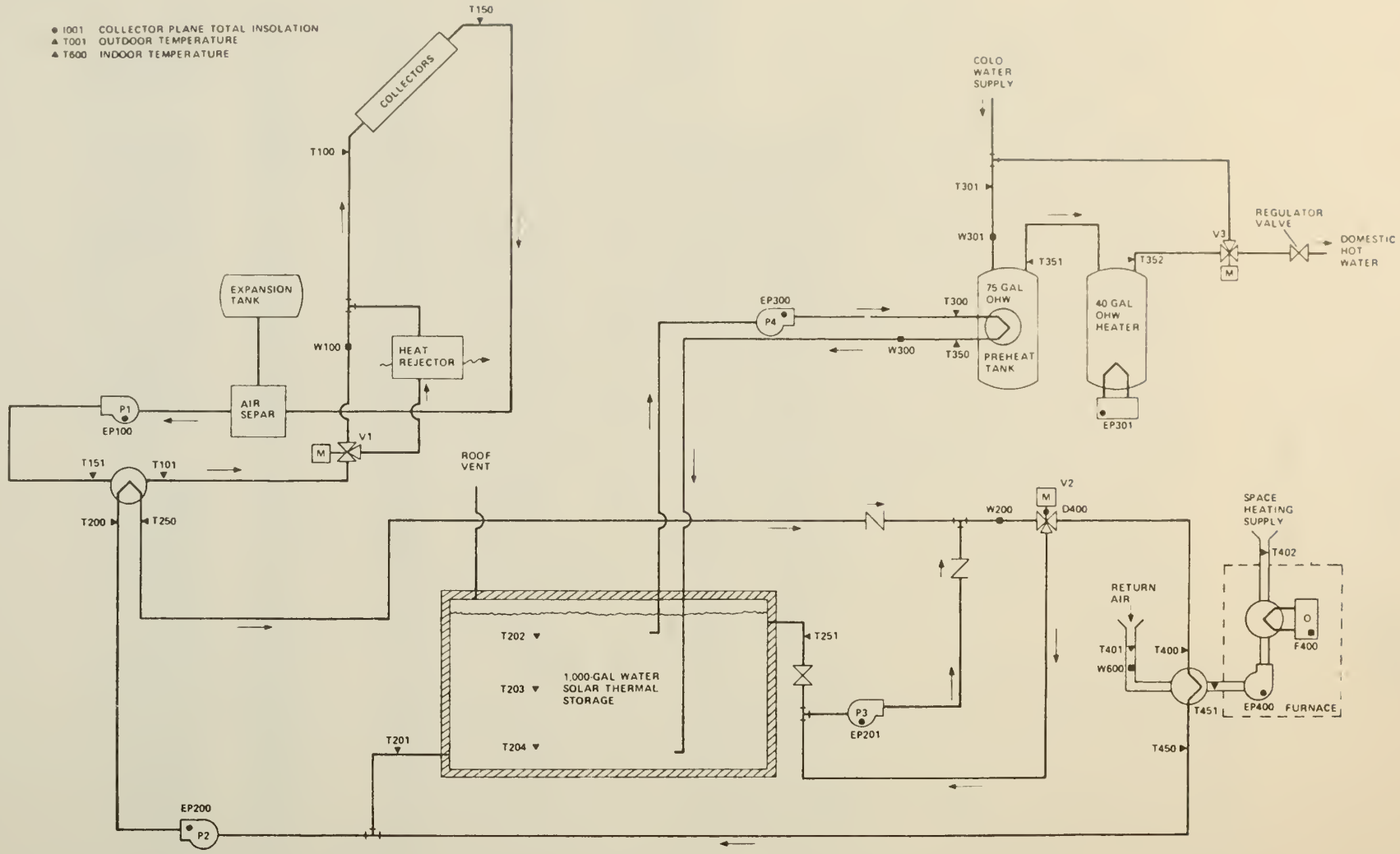

Figure 1. STEWART–TEELE–MITCHELL SOLAR ENERGY SYSTEM SCHEMATIC

II. PERFORMANCE EVALUATION

INTRODUCTION

The solar energy system operated continuously during February. Solar energy satisfied 13 percent of the DHW requirements and 13 percent of the space heating requirements. The solar energy system provided fossil fuel energy savings of 2.2 million Btu at an electrical energy expense of 0.2 million Btu. The collector loop heat transfer fluid appears to have frozen during the period from February 10 through February 15 when temperatures were recorded as low as -19°F. Data was lost for three days in February.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 18.0 million Btu for a daily average of 1485 Btu per square foot. This was above the estimated average daily solar radiation for this geographical area during February of 1131 Btu per square foot for a south-facing plane with a tilt of 45 degrees to the horizontal. The average ambient temperature during February was 13°F as compared with the long-term average for February of 24°F. The number of heating degree-days for the month (based on a 65°F reference) was 1308, as compared with the long-term average of 1162.

THERMAL PERFORMANCE

System - During February the solar energy system performed somewhat poorer than expected. The expected performance was determined from a modified f-chart analysis using measured weather and subsystem loads as inputs. Solar energy collected was 3.5 million Btu versus an estimated 6.1 million Btu. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 1.6 million Btu. System total solar fraction was 13 percent versus an estimated 57 percent.

Collector - The total incident solar radiation on the collector array for the month of February was 18.0 million Btu. During the period the collector loop was operating, the total insolation amounted to 13.6 million Btu. The total collected solar energy for the month of February was 3.5 million Btu, resulting in a collector array efficiency of 19 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 3.0 million Btu, while solar energy delivered from the collector array directly to the loads amounted to 0.21 million Btu. Energy loss during transfer from the collector array to storage and loads was 0.27 million Btu. This loss represented 8 percent of the energy collected. Operating energy required by the collector loop was 0.13 million Btu.

Storage - Solar energy delivered to storage was 3.0 million Btu and there was no auxiliary energy contribution to storage. There were 1.8 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 1.0 million Btu. This loss represented 33 percent of the

energy delivered to storage. The storage efficiency was 67 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 88°F.

DHW Load - The DHW subsystem consumed 0.33 million Btu of solar energy and 0.47 million Btu of auxiliary electrical energy to satisfy a hot water load of 0.52 million Btu. The solar fraction of this load was 13 percent. Losses from the DHW subsystem were 0.28 million Btu. The DHW subsystem consumed a total of 0.061 million Btu of operating energy, resulting in an electrical energy savings of 0.016 million Btu. A daily average of 27 gallons of DHW was consumed at an average temperature of 126°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 1.3 million Btu of solar energy and 8.6 million Btu of auxiliary thermal energy (equivalent to 14.3 auxiliary fossil fuel energy) to satisfy a space heating load of 9.9 million Btu. The solar fraction of this load was 13 percent. The space heating subsystem consumed a total of 0.62 million Btu of operating energy, resulting in an electrical energy expense of 0.058 million Btu.

OBSERVATIONS

During the period from February 10 through February 15, the heat transfer fluid in the collector/heat exchanger loop of the energy collection and storage subsystem (ECCS) appeared to freeze during the night. Temperatures during this period reached nighttime lows between -12°F and -19°F. The days were sunny with daytime temperatures about 6 to 7°F. The scan data shows that the control system normally activated the collector loop pump (EP100), but no flow ensued with the collector inlet temperature (T100) registering 32°F, and the collector outlet temperature (T150) registering as much as 244°F. The temperature at the input to the collector loop heat exchanger (T151) gradually increased to a high of 212°F with the heat exchanger/storage loop pump (EP200) operating normally. The data indicates that a small amount of solar energy was delivered to storage. On February 9 and 10, the heat transfer fluid thawed after approximately three hours of intense insolation, and the flow in the collector/heat exchanger loop was almost normal.

On February 16, the ECSS control system malfunctioned by failing to activate the heat exchanger/storage loop pump (EP200) when the collector/heat exchanger loop was operating.

During February, the measured maximum flow in the collector loop declined by approximately 0.5 gallons per minute since the apparent freezing of the heat transport fluid.

Despite the problems discussed above, the solar energy system registered its best performance of the winter season.

ENERGY SAVINGS

The solar energy system provided a fossil fuel energy savings of 2.2 million Btu at an expense of 0.17 million Btu of electrical energy. The DHW subsystem

provided an electrical energy savings of 0.018 million Btu; the space heating subsystem contributed a fossil fuel energy savings of 2.2 million Btu at an electrical energy expense of 0.06 million Btu.

III. ACTION STATUS

There has been no change in the action status since January. Action on the recommended instrumentation modification and the resolution of sensor anomalies has not been scheduled by Boeing.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: STEWART-TEELE-MITCHELL
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1019-79/12

SITE/SYSTEM DESCRIPTION:
THE STEWART-TEELE-MITCHELL SOLAR SYSTEM IS INSTALLED IN A 1300 SQ.FT. SINGLE FAMILY DWELLING LOCATED IN MALTA, NY. SOLAR ENERGY IS USED FOR SPACE HEATING AND HOT WATER PREHEATING. THE COLLECTOR ARRAY HEAT TRANSFER FLUID IS 40% GLYCOL/WATER. THE STORAGE AND SOLAR ENERGY DISTRIBUTION FLUID IS WATER. SOLAR ENERGY CAN BE DELIVERED DIRECTLY TO THE LOAD OR TO STORAGE. AUXILIARY SPACE HEATING IS PROVIDED BY AN OIL-FIRED, FORCED AIR FURNACE.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	17.050 MILLION BTU
	41571 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	3.476 MILLION BTU
	8047 BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	13 DEGREES F
AVERAGE BUILDING TEMPERATURE	62 DEGREES F
FOSS SOLAR CONVERSION EFFICIENCY	0.09
FOSS OPERATING ENERGY	0.130 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.813 MILLION BTU
TOTAL ENERGY CONSUMED	10.313 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.516	9.863	N.A.	10.379 MILLION BTU
SOLAR FRACTION	13	13	N.A.	13 PERCENT
SOLAR ENERGY USED	0.332	1.311	N.A.	1.643 MILLION BTU
OPERATING ENERGY	0.061	0.622	N.A.	0.813 MILLION BTU
AUX. THERMAL ENERGY	0.469	8.552	N.A.	9.021 MILLION BTU
AUX. ELECTRIC FUEL	0.468	N.A.	N.A.	0.468 MILLION BTU
AUX. FOSSIL FUEL	N.A.	14.254	N.A.	14.254 MILLION BTU
ELECTRICAL SAVINGS	0.016	-0.258	N.A.	-0.171 MILLION BTU
FOSSIL SAVINGS	N.A.	2.194	N.A.	2.194 MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.563

* DENOTES UNAVAILABLE DATA
0 DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: STEWART-TEELE-MITCHELL
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1018-79/12

SITE/SYSTEM DESCRIPTION:
THE STEWART-TEELE-MITCHELL SOLAR SYSTEM IS INSTALLED IN A 1900 SQ.FT. SINGLE FAMILY DWELLING LOCATED IN MALTA, NY. SOLAR ENERGY IS USED FOR SPACE HEATING AND HOT WATER PREHEATING. THE COLLECTOR ARRAY HEAT TRANSFER FLUID IS 40% GLYCOL/WATER. THE STORAGE AND SOLAR ENERGY DISTRIBUTION FLUID IS WATER. SOLAR ENERGY CAN BE DELIVERED DIRECTLY TO THE LOAD OR TO STORAGE. AUXILIARY SPACE HEATING IS PROVIDED BY AN OIL-FIRED, FORCED AIR FURNACE.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	18.946 GIGA JOULES
	472080 KJ/SQ.M.
COLLECTED SOLAR ENERGY	3.668 GIGA JOULES
	91396 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	-11 DEGREES C
AVERAGE BUILDING TEMPERATURE	17 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.09
ECSS OPERATING ENERGY	0.137 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.858 GIGA JOULES
TOTAL ENERGY CONSUMED	20.357 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.545	10.406	N.A.	10.950 GIGA JOULES
SOLAR FRACTION	13	13	N.A.	13 PERCENT
SOLAR ENERGY USED	0.351	1.382	N.A.	1.733 GIGA JOULES
OPERATING ENERGY	0.064	0.657	N.A.	0.858 GIGA JOULES
AUX. THERMAL ENG	0.404	9.023	N.A.	9.517 GIGA JOULES
AUX. ELECTRIC FUEL	0.404	N.A.	N.A.	0.494 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	15.038	N.A.	15.038 GIGA JOULES
ELECTRICAL SAVINGS	0.017	-0.261	N.A.	-0.131 GIGA JOULES
FOSSIL SAVINGS	N.A.	2.305	N.A.	2.305 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.562

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT

ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: STEWART-TEELE-MITCHELL

REPORT PERIOD: FEBRUARY, 1979

SOLAR/1118-78/02

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.344	16	0.010	N	0.003	0.000	0.329
2	0.709	16	0.067	O	0.007	0.000	0.095
3	0.892	14	0.116	T	0.007	0.000	0.112
4	0.701	13	0.160		0.006	0.000	0.193
5	0.491	16	0.125	A	0.004	0.000	0.217
6	0.917	8	0.181	P	0.007	0.000	0.165
7	0.145	8	0.003	P	0.000	0.000	0.021
8	0.740	16	0.112	L	0.006	0.000	0.115
9	0.862	5	0.162	I	0.007	0.000	0.140
10	0.950	-1	0.074	C	0.006	0.000	0.078
11	0.960	-7	0.042	A	0.006	0.000	0.038
12	0.754	-6	0.037	B	0.006	0.000	0.053
13	0.878	-6	0.005	L	0.008	0.000	0.005
14	0.865	-4	0.006	E	0.005	0.000	0.007
15	0.943	2	0.073		0.006	0.000	0.062
16	0.820	1	0.106		0.004	0.144	0.129
17	1.071	-9	0.070		0.006	0.002	0.059
18	*	*	*		*	*	*
19	*	*	*		*	*	*
20	0.711	18	0.073		0.006	0.000	0.098
21	0.242	30	0.110		0.002	0.000	0.375
22	0.411	36	0.062		0.006	0.000	0.135
23	0.153	31	0.000		0.000	0.000	0.428
24	*	*	*		*	*	*
25	0.287	30	0.001		0.000	0.000	0.002
26	0.000	30	0.008		0.000	0.000	0.376
27	0.072	27	0.017		0.000	0.000	0.230
28	1.101	33	0.089		0.000	0.000	0.064
SUM	17.950	-	2.022	N.A.	0.130	0.162	-
AVG	0.641	13	0.072	N.A.	0.005	0.006	0.091
NBS ID	0001	N113			0102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: STEWART-TEELE-MITCHELL
REPORT PERIOD: FEBRUARY,1978

SOLAR/1019-78/02

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.344	0.117	0.032	18	0.094
2	0.709	0.662	0.212	21	0.299
3	0.802	0.743	0.246	23	0.276
4	0.701	0.580	0.196	21	0.280
5	0.401	0.246	0.078	23	0.141
6	0.917	0.822	0.240	12	0.271
7	0.145	0.000	0.000	12	0.000
8	0.740	0.526	0.152	*	0.206
9	0.862	0.741	0.207	8	0.240
10	0.850	0.674	0.120	8	0.141
11	0.960	0.800	0.115	1	0.119
12	0.754	0.642	0.061	5	0.081
13	0.878	0.700	0.026	6	0.029
14	0.865	0.749	0.038	*	0.044
15	0.943	0.532	0.158	7	0.167
16	0.830	0.663	0.275	8	0.329
17	1.071	0.860	0.274	*	0.256
18	*	*	*	*	*
19	*	*	*	*	*
20	0.711	0.565	0.165	*	0.231
21	0.242	0.133	0.037	*	0.153
22	0.411	0.333	0.104	*	0.253
23	0.153	0.003	0.001	*	0.004
24	*	*	*	*	*
25	0.287	0.003	0.006	*	0.023
26	0.000	0.000	0.000	31	0.000
27	0.072	0.000	0.000	*	0.000
28	1.101	0.914	0.352	40	0.320
SUM	17.950	13.561	3.476	-	-
AVG	0.641	0.484	0.124	15	0.104
NBSID	0001		0100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: STEWART-TEELE-MITCHELL SOLAR/1018-78/32
REPORT PERIOD: FEBRUARY, 1978

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.040	0.000	0.018	71	0.000
2	0.220	0.064	0.112	80	0.766
3	0.235	0.095	0.063	84	0.675
4	0.186	0.157	-0.012	86	0.777
5	0.080	0.113	-0.028	83	0.942
6	0.203	0.153	0.021	84	0.958
7	0.000	1.003	-0.022	80	1.000
8	0.142	0.112	0.004	82	0.000
9	0.203	0.154	0.004	84	0.777
10	0.087	0.067	-0.002	80	0.742
11	0.067	0.023	-0.002	80	0.333
12	0.053	0.025	-0.031	86	-0.125
13	0.030	0.002	0.002	84	0.160
14	0.009	0.000	-0.030	82	-3.350
15	0.166	0.066	0.041	85	0.645
16	0.128	0.097	0.001	88	0.764
17	0.227	0.042	0.032	90	0.327
18	*	*	-0.003	*	*
19	*	*	0.001	*	*
20	0.157	0.070	0.098	90	1.270
21	0.028	0.109	-0.111	83	-0.113
22	0.086	0.061	0.068	86	1.500
23	0.000	0.000	-0.085	82	19.734
24	*	*	-0.026	*	*
25	0.000	0.001	-0.010	83	1.000
26	0.000	0.008	-0.020	81	1.000
27	0.000	0.017	-0.018	78	1.000
28	0.321	0.086	0.150	91	0.763
SUM	2.998	1.814	0.205	-	-
AVG	0.107	0.065	0.007	88	0.673
NRS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: STEWART-TEELE-MITCHELL
REPORT PERIOD: FEBRUARY,1979

SOLAR/1018-79/02

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.017	2	0.009	0.003	0.017	0.017	N	-0.003	N	59	122	27
2	0.026	3	0.020	0.003	0.023	0.023	O	-0.001	O	52	115	41
3	0.028	13	0.027	0.003	0.019	0.019	T	0.003	T	52	117	45
4	0.005	12	0.000	0.000	0.008	0.008		0.000		48	118	9
5	0.030	18	0.021	0.003	0.019	0.019	A	0.006	A	47	119	47
6	0.029	22	0.024	0.002	0.017	0.017	P	0.002	P	55	120	45
7	0.016	16	0.003	0.004	0.016	0.016	P	-0.003	P	54	130	24
8	0.003	13	0.013	0.002	0.009	0.009	L	-0.001	L	56	127	4
9	0.023	9	0.014	0.001	0.017	0.017	I	-0.000	I	54	127	32
10	0.025	11	0.017	0.002	0.019	0.019	C	0.002	C	45	127	35
11	0.012	11	0.000	0.000	0.014	0.014	A	0.000	A	55	128	17
12	0.039	25	0.025	0.005	0.030	0.030	B	0.011	B	54	130	55
13	0.003	27	0.002	0.003	0.011	0.011	L	-0.002	L	62	128	4
14	0.014	15	0.000	0.000	0.017	0.017	E	0.000	E	61	126	19
15	0.003	11	0.015	0.004	0.012	0.012		-0.003		57	127	5
16	0.039	8	0.017	0.002	0.020	0.020		-0.001		51	127	56
17	0.005	9	0.013	0.001	0.011	0.011		-0.000		54	127	7
18	*	*	*	*	*	*		*		*	*	*
19	*	*	*	*	*	*		*		*	*	*
20	0.009	6	0.007	0.002	0.005	0.005		-0.002		50	129	1
21	0.000	5	0.000	0.000	0.006	0.006		0.000		58	123	0
22	0.038	6	0.020	0.004	0.024	0.024		0.001		49	131	53
23	0.023	6	0.000	0.000	0.022	0.022		0.000		40	130	23
24	*	*	*	*	*	*		*		*	*	*
25	0.013	18	0.001	0.001	0.015	0.015		-0.001		43	132	18
26	0.022	13	0.008	0.001	0.019	0.019		0.001		51	131	29
27	0.031	24	0.017	0.006	0.030	0.030		0.007		45	133	42
28	0.016	17	0.025	0.003	0.019	0.019		-0.002		52	131	24
SUM	0.516	-	0.332	0.061	0.468	0.468	N.A.	0.016	N.A.	-	-	750
AVG	0.018	13	0.012	0.002	0.017	0.017	N.A.	0.001	N.A.	52	126	27
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: STEWART-TEELE-MITCHELL
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1018-79/02

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.328	0	0.000	0.019	0.328	N	0.547	-0.001	0.000	63	16
2	0.322	11	0.036	0.022	0.286	O	0.477	-0.002	0.060	65	16
3	0.134	55	0.073	0.011	0.061	T	0.101	-0.003	0.122	60	14
4	0.287	47	0.135	0.021	0.151		0.252	-0.005	0.226	58	12
5	0.437	20	0.086	0.027	0.351	A	0.585	-0.003	0.143	62	16
6	0.322	40	0.127	0.023	0.194	P	0.324	-0.004	0.212	62	9
7	0.493	0	0.000	0.027	0.493	P	0.822	0.000	0.000	61	8
8	0.335	21	0.072	0.024	0.263	L	0.438	-0.003	0.120	64	16
9	0.332	34	0.114	0.025	0.218	I	0.363	-0.005	0.191	62	5
10	0.442	11	0.050	0.026	0.393	C	0.654	-0.003	0.083	59	-1
11	0.522	7	0.037	0.033	0.485	A	0.809	-0.003	0.061	59	-7
12	0.490	3	0.013	0.026	0.477	B	0.795	-0.001	0.021	59	-6
13	0.527	1	0.003	0.028	0.524	L	0.874	-0.000	0.005	63	-6
14	0.499	1	0.006	0.032	0.493	E	0.821	-0.002	0.010	57	-4
15	0.400	11	0.044	0.027	0.355		0.592	-0.003	0.074	63	2
16	0.457	11	0.048	0.026	0.409		0.682	-0.002	0.080	62	1
17	0.432	12	0.051	0.028	0.381		0.635	-0.003	0.084	58	-9
18	*	*	*	*	*		*	*	*	*	*
19	*	*	*	*	*		*	*	*	*	*
20	0.282	18	0.050	0.019	0.231		0.386	-0.002	0.084	60	18
21	0.348	26	0.091	0.022	0.257		0.428	-0.003	0.151	60	30
22	0.149	15	0.023	0.009	0.126		0.210	-0.001	0.038	63	36
23	0.312	21	0.066	0.021	0.246		0.411	-0.002	0.109	63	31
24	*	*	*	*	*		*	*	*	*	*
25	0.256	0	0.000	0.015	0.256		0.427	-0.000	0.000	65	30
26	0.312	0	0.000	0.019	0.312		0.520	0.000	0.000	67	33
27	0.267	0	0.000	0.015	0.267		0.445	0.000	0.000	63	27
28	0.123	37	0.046	0.010	0.078		0.129	-0.002	0.076	64	33
SUM	9.863	-	1.311	0.622	8.552	N.A.	14.254	-0.058	2.184	-	-
AVG	0.352	13	0.047	0.022	0.305	N.A.	0.509	-0.002	0.078	62	13
NRS	0402	N400	0400	0403	0401		0410	0415	0417	N406	N113

* DENOTES UNAVAILABLE DATA.
∅ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT

ENVIRONMENTAL SUMMARY

SITE: STEWART-TEELE-MITCHELL
REPORT PERIOD: FEBRUARY,1979

SOLAR/1018-79/02

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	796	N	16	18	N	N	N
2	1639	O	16	21	O	O	O
3	2065	T	14	20	T	T	T
4	1622		13	21			
5	1137	A	16	20	A	A	A
6	2124	P	8	12	P	P	P
7	336	P	8	12	P	P	P
8	1713	L	16	*	L	L	L
9	1905	I	5	8	I	I	I
10	1967	C	-1	0	C	C	C
11	2222	A	-7	1	A	A	A
12	1745	B	-6	5	B	B	B
13	2032	L	-6	6	L	L	L
14	2001	E	-4	*	E	E	E
15	2182		2	7			
16	1942		1	8			
17	2480		-0	*			
18	*		*	*			
19	*		*	*			
20	1646		18	*			
21	559		32	*			
22	952		36	*			
23	355		31	*			
24	*		*	*			
25	654		30	*			
26	220		30	31			
27	167		27	*			
28	2549		33	40			
SUM	41571	N.A.	-	-	-	-	-
AVG	1485	N.A.	13	15	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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